MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

February 9, 2001

TO: Tom Weston, Permit Writer
Permits Unit
Groundwater Program Section

FROM: Bob Deatrick, Soil Scientist
Hydrogeologic Review Unit
Groundwater Program Section

SUBJECT: Williamsburg Receiving and Storage

The Irrigation Management Plan (IMP) submitted by Environmental Solutions, Inc., on behalf of Williamsburg Receiving and Storage (WRS) has been reviewed. According to the IMP, WRS proposes to discharge 42,000 gallons per day (15.3 million gallons per year). The discharge is to be applied to land located in Section 9 of Whitewater Township (T 28 N., R 09 W.) in Grand Traverse County. The discharge is proposed to occur year-round; however, the technology and management of the discharge changes with the season. The "Spring – Summer" (SS) discharge runs from May through September and the "Fall – Winter" (FW) discharge occurs from October through April. The SS discharge is applied to an 80-acre cherry orchard that has been subdivided into four zones (each has 17 wetted acres). WRS proposes to utilize "Trickle Irrigation" technology for the SS discharge, with the nodes for the system to be spaced approximately six feet apart. The discharge is to be rotated among the four zones on a daily basis. As such, each zone would receive one day of discharge followed by three days of rest. Under such operation, the maximum daily application rate will be 0.09 inches per acre (0.18 inches per week). The IMP also describes the management of the discharge when (up to) three zones are out of service. Under such a scenario, one zone would be utilized and would receive the total discharge. The daily maximum application rate would remain at 0.09 inches however, the weekly application would be approximately 0.63 inches. The FW discharge occurs to an area separate from the SS discharge. The FW discharge is to be applied to 30 acres of land that has been subdivided into six, four wetted-acre zones using spray irrigation. The zones are to be rotated on a daily basis such that each zone will receive one day of discharge followed by a minimum of five days of rest. The maximum daily application rate to the FW system is 0.4 inches. The IMP indicates that the system is expected to operate five days per week. Under such operation, the daily and weekly application rates would be the same. With regard to effluent characterization, according to available information, WRS expects to generate an effluent with less that five mg/l Total Inorganic Nitrogen (TIN) and less than four mg/l Total Phosphorus (TP).

Review Summary

The IMP submitted on behalf of WRS was reviewed and was found to be adequate with regard to providing information related to the management of the proposed discharge. The soils within the proposed discharge area possess suitable physiochemical characteristics to accommodate the proposed application rates and phosphorus loading. The proposal by WRS to apply 15.3 million gallons of untreated wastewater to the area described in the submitted IMP does not appear to present any significant environmental concerns.

Recommendations

- Limit effluent TIN to less than five mg/l.
- Limit effluent TP to less than four mg/l.
- Limit SS daily maximum application rate of 0.09 inches.
- Limit SS weekly maximum application rate to 0.63 inches.
- Limit FW daily maximum application rate to 0.4 inches.
- Limit FW weekly maximum application rate to 0.4 inches.
- WRS should be made aware that any nutrient inputs to the irrigated areas from such sources as commercial fertilizers, biosolids or manure should credit or otherwise take into account the quantity of nitrogen supplied by the application of the effluent.

Soils

According to the Grand Traverse County Soil Survey, U.S. Department of Agriculture, Soil Conservation Service, 1966, the soils within the irrigated areas are primarily of two different series, Emmet and Kalkaska. The Emmet series consists of very deep, well drained and moderately well drained soils formed in sandy loam till on end moraines, drumlins, and ground moraines. Permeability is moderate or moderately slow (1.0 – 3.5 inches per hour). Slopes range from 0 to 50 percent. The Kalkaska series consists of very deep, somewhat excessively drained soils formed in sandy deposits on outwash plains, valley trains, moraines, and stream terraces. These soils have rapid permeability (6.0 – 20 inches per hour). Slopes range from zero to 70 percent.

Hydraulic Loading

As mentioned earlier, the SS discharge is applied to an 80-acre site, which has been subdivided into four zones. Each of the zones approximately has 17 wetted acres. WRS proposes to utilize "Trickle Irrigation" technology for the SS discharge. According to the IMP the nodes for the trickle system are to be spaced approximately six feet apart. The nodes are the points where the wastewater is discharged from onto the ground. WRS proposes to rotate the discharge among the four zones on a daily basis, meaning that an individual zone would receive one day of discharge followed by three days of rest. As such, under normal operating conditions, the maximum daily application rate will be 0.09 inches per acre (0.18 inches per week). However, the IMP also describes the management of the discharge when (up to) three of the zones may have been taken out of service. Under such a scenario, one zone would receive the total discharge for an unspecified period. The daily maximum application rate would remain at 0.09 inches; however; the weekly application would increase to approximately 0.63 inches.

According to the IMP, the FW discharge is to be applied to 30 acres of land that has been subdivided into six, four wetted-acre zones. The application of the wastewater is to be made by spray irrigation. As with the SS discharge, the zones are to be rotated on a daily basis. Individual zones are to receive one day of discharge followed by a minimum of five days of rest. The IMP indicates that the maximum daily application rate to the FW system is 0.4 inches and that the system is expected to operate five days per week. As such, the daily and weekly application rates would be the same (0.4 inches).

Utilizing the most restrictive reported permeability value (1.0 inch per hour) for the soils found within the proposed discharge areas, the allowable daily hydraulic loading is approximately 1.7 inches. As such, with regard to the SS discharge, both the proposed daily and weekly maximum application rates of 0.09 inches and 0.63 are acceptable. The proposed maximum daily and weekly application rates as they relate to the FW discharge are acceptable as well.

With regard to the SS discharge, it is recommended that the permit limit the daily maximum application rate to 0.09 inches. The weekly maximum should be limited to 0.63 inches. The permit should limit the FW discharge to 0.4 inches per day as well as per week.

Crops

The IMP indicates that the SS discharge area is an active cherry orchard. The available information regarding the nutrient uptake characteristics of this crop is inconclusive. While it is clear that some nutrient uptake can and does occur, specific uptake rates for this are not available. As such, in order to be conservative with regard to the system's ability to treat the applied effluent, it has been assumed that no nutrient uptake occurs for the SS season.

The IMP indicates that the FW discharge is applied to areas that have been or will be planted with a forage crop of clover, red fescue, or alfalfa. The crop is to be harvested approximately three times per year, depending on conditions for the year. The yield goal for the crop is approximately 3.5 tons per acre per year. According to available information, the proposed crop, at the aforementioned annual yield, can be expected to remove approximately 20 LB of phosphorus and 150 LB of nitrogen

Nutrient Loading

Nitrogen

The IMP indicates that the effluent is to contain less than five mg/l TIN and as such will meet the requirement of Rule 2222 of the Part 22 Rules prior to discharge. As such, the TIN applied to the irrigated areas through the discharge does appear to present a significant environmental concern at this time. It is recommended that permit limit TIN in the effluent to less than five mg/l. In addition, WRS should be made aware that any nutrient inputs to the irrigated area from such sources as commercial fertilizers, biosolids or manure should credit or otherwise take into account the quantity of nitrogen supplied by the application of the effluent.

Phosphorus

As indicated earlier, WRS expects to generate an effluent with 4 mg/l or less TP. As such, the discharge during the SS season will result in an application of approximately 3.1 LB TP per acre. The discharge during the FW season is expected to result in an application of approximately 12.4 LB TP per acre.

As indicated earlier, the soils within the proposed discharge areas are of the Emmet and Kalkaska series. According to published information, these soils possess "high" (> 1600 LB P / Ac-3ft) Phosphorus Adsorption Capacity (PAC). Soil test data was not provided with the IMP. For the purposes of the review it was assumed that the Bray P_1 soil phosphorus level was approximately 75 PPM (150 LB P / Ac). If no credit for phosphorus removal through plant uptake is assumed, then the theoretical site-life with regard to PAC for the SS discharge

site is approximately 450 years. The theoretical site-life for the FW discharge site is approximately 115 years.

Conclusion

The IMP is adequate with regard to providing information related to the management of the proposed discharge. The proposal by WRS to apply 15.3 million gallons of untreated wastewater to the area described in the submitted IMP does not appear to present any significant environmental concerns.

Please contact me if you have any questions.